RACAL CUSTOMER TRAINING COLLEGE TRAINING NOTES	No:
	Issue:
	Date:

TITLE: S.C.O.R.E. Serial Control Of Racal Equipment

The SCORE format for serial control is based on sixteen, 48 bit synchronous frames (numbered 0 to 15). Each 48 bit frame contains a 16 bit preamble, (synchronisation, word identification etc), followed by a 32 bit data word. This gives a total capacity of approximately 400 separate lines. Normally, only 4 or 5 words are used leaving considerable scope for further expansion.

Control Data

Under static conditions, when there is no new data in the control data information, routine frames are sent in pairs in numerical sequence as determined by the word scanning circuits.

Error detection is achieved at the controlled terminal by using a frame comparison technique whereby two identical frames must be received before a change of function can occur.

An exception to this can be made for the frequency frame (containing word '1') which can be sent singly - new data frames only - to enable new frequency data to be transferred more quickly. This is achieved by the inclusion of external links.

When any data word in a frame contains new data - indicating 'change of function' information - the numerical sequence of frames will be interrupted and the frame containing new data will be inserted after the frame currently being transmitted has finished. Frames will therefore be sent out of sequence with priority being given to those frames containing new data. This is done by the use of 'new data latches' where a latch is set every time a control setting is changed, thereby indicating that the appropriate word required immediate transmission, The latch being reset after the new data word has been transmitted.

TITLE: SCORE Contd/2..... No:

Revertive Data

Although Word '0' is sent as part of the control data it does not contain any control information and is used only for revertive data being transmitted back to the Control Unit via the revertive highway.

All other words used are also transmitted back singly and frame comparison does not take place since revertive data is only used to provide a confidence check only.

Preamble

The 16 bit preamble added to the front of each of the 32 bit data words is made up as follows:

Bits 0 to 5	SYN CODE	011111 N.B. Five consecutive 1's do not normally occur in BCD therefore this is a unique code.
Bits 6 & 7	Transmit/RECEIVE	RECEIVE = 01 TRANSMIT = 10
Bit 8	CONTROL INHIBIT	INHIBIT = 1 (In the 'CHECK' status)
Bit 9	Return MONITOR	Only set to '1' when single frequency frames are being sent.
Bits 10 & 11	EQUIPMENT ADDRESS	
Bits 12 to 15	DATA WORD IDENT	

TITLE: SCORE Contd/3..... No:

Data Words (32 Bit)

WORD '0'	MONITORING FUNCTION. ONLY USED FOR REVERTIVE DATA
WORD '1'	FREQUENCY DATA
WORD 2	ANALOGUE (B.F.O.: I.F. GAIN ETC.)
WORD 3	NOT USED
WORD 4	VHF MODE (A.M., C.W., BANDWIDTH ETC.)
WORD 5	H.F. MODE (A.M., C.W., BANDWIDTH ETC.)

Basic Operation

The control unit front panel settings information is parallel loaded into the control output shift registers. The 32 bit control data word is then clocked out of the register in serial form, followed by the remaining control data words, in the order determined by the word scanning circuits, and applied to the preamble generator. The 16 bit preamble is added to the front of each data word and the resulting 48 bit frames are repeated and applied as frame pairs to the control highway. Revertive data back to the Control Unit is essentially a reverse process but without frame comparison, and is clocked into the DISPLAY input registers and applied in parallel form to the Control Unit display.

Clock Circuits

These provide the timing signals required by various parts of the system.

The basic clock signal uses the internal 19.2KHz clock generator or an external clock may be utilised.

TITLE: SCORE Contd/4..... No:

Signal Line Requirements

Requirements are based on CCITT recommendations V24 and V28 and are suitable for MODEM operations.

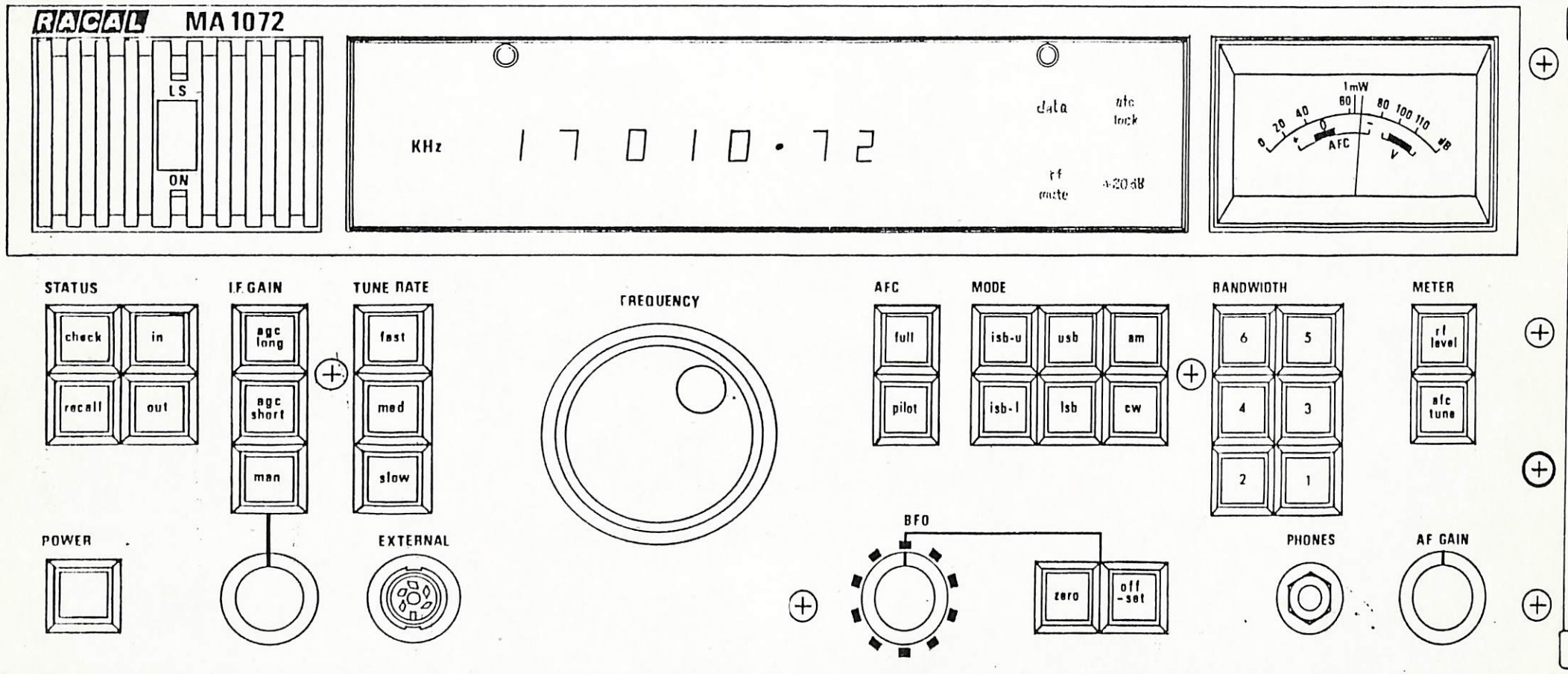
Separate lines are used for DATA, CLOCK and REVERTIVE HIGHWAYS.

Audio traffic monitor connection back to the Control Unit is via a 2 - core cable. N.B. This can be shared with the REVERTIVE highway in special systems.

Line Levels

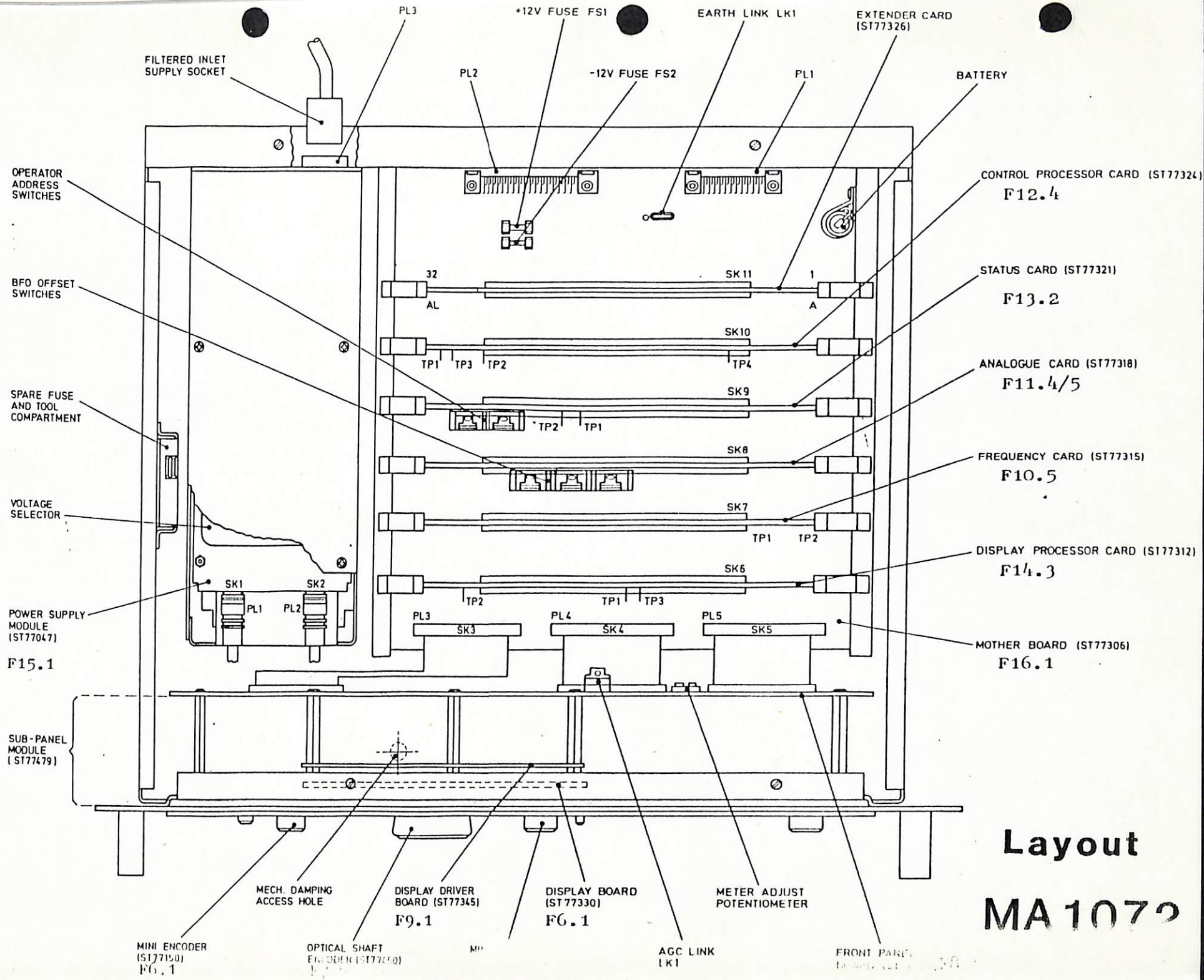
Binary 1 = Voltage more negative than -3V
Binary 0 = Voltage more positive than =3V

In practice, voltage levels are approximately plus and minus 12v.
(Binary 0 and 1 respectively).



Front Panel

MA 1072



Layout

MA1072

TABLE 1: SCORE Data Format

	BIT No	BIT FUNCTION OR FORCED STATE									
PREAMBLE	0	0									
	1	1									
	2	1	SYNC								
	3	1	CODE								
	4	1									
	5	1									
	6	TRANSMIT									
	7	RECEIVE									
	8	CONTROL INHIBIT									
	9	RETURN MONITOR									
			MONITOR (0)	FREQUENCY (1)	ANALOGUE (2)	HF MODE (5)	EQUIPMENT ADDRESSING (8)	OPERATOR ADDRESSING (9)			
	10	ADDRESS	0	0	0	0	1	1	10		
	11	EQUIPMENT	0	0	0	0	1	0	11		
	12	1 DATA	0	1	0	1	0	1	12		
	13	2 WORD	0	0	1	0	0	0	13		
	14	4 IDENT	0	0	0	1	0	0	14		
	15	8	0	0	0	0	1	1	15		
DATA WORD	16		A	0	1	0	1	1	16		
	17		B USER	0 NOT	2 BFO	0 NOT	2	2	17		
	18		C FUNCTION	0 USED	4 x10 Hz	0 USED	4	4	18		
	19		D	0	8	0	8 EQUIPMENT ADDRESS	8 OPERATOR ADDRESS	19		
	20		0	1	1	1 METERED	10	10	20		
	21		0	2	2 BFO	2 FUNCTION	20	20	21		
	22		0	4 10 Hz	4 x100 Hz	4	40	40	22		
	23		0	8	8	8	80	80	23		
	24		0 NOT	1	1 BFO	AFC ON	FREQ. FC INH	IN	24		
	25		0 USED	2	2 xkHz	FULL	MONITOR INH	DISPLAY INHIBIT	25		
	26		0	4 100 Hz	4	0	SLAVE	THROUGH	26		
	27		0	8	BFO SIGN	PILOT	0 NOT	CHECK	27		
	28		0	1	0	1 MODE	0 USED	PRESERVE	28		
	29		AFC LOCK	2	0	2	0	STATUS INHIBIT	29		
	30		0	4 kHz	0	0	0	OUT	30		
	31		REDUCED SIGNAL	8	0	0	0	MONITOR	31		
	32		TRANSMITTING	1	0	SYMMETRICAL	1	1	32		
	33		FAULT	2	0 NOT	0	2	2	33		
	34		FC ERROR	4 10 kHz	0 USED	0	4	4	34		
	35		0	8	0	0	8 EQUIPMENT ADDRESS	8 OPERATOR ADDRESS	35		
	36		1	1	0	AGC DUMP	10	10	36		
	37		2 METERED	2	0	1	20	20	37		
	38		4 FUNCTION	4 100 kHz	0	2 AGC	40	40	38		
	39		8	8	1	4	80	80	39		
	40		1	1	2	1	FREQ. FC INH	IN	40		
	41		2	2	4 IF	2 BANDWIDTH	MONITOR INH	DISPLAY INHIBIT	41		
	42		4	4 MHz	8 GAIN	4	SLAVE	THROUGH	42		
	43		0 METER READING	8	0	0	0 NOT USED	CHECK	43		
	44		8	1 10 MHz	16	W	0	PRESERVE	44		
	45		16	2	32	X USER	0	STATUS INHIBIT	45		
	46		32	1 SINGLE FRAME	64	Y FUNCTION	0	OUT	46		
	47		64	2 CHECK BITS	128	Z	0	MONITOR	47		

BITS 32 to 47 ARE A REPEAT OF BITS 16 to 31. THIS PROVIDES HIGH SECURITY AGAINST INCORRECT ADDRESSING

CODING OF FUNCTIONAL GROUPS

METERED FUNCTION — WORD 5 BITS 20, 21, 22, 23; WORD 0 BITS 36, 37, 38, 39

1 RECEIVE SIGNAL LEVEL
2 AFC TUNING

BANDWIDTH — WORD 5 BITS 40, 41, 42

0
1 FILTER 1 (NARROWEST BANDWIDTH)
2 FILTER 2
3 FILTER 3
4 FILTER 4
5 FILTER 5
6 FILTER 6

SYMMETRICAL MODES — WORD 5 BITS 28, 29 WHEN WORD 5 BIT 32 IS SET TO 1

1 AM
2 CW

SIDEBAND MODES — WORD 5 BITS 28, 29 WHEN WORD 5 BIT 32 IS SET TO 0

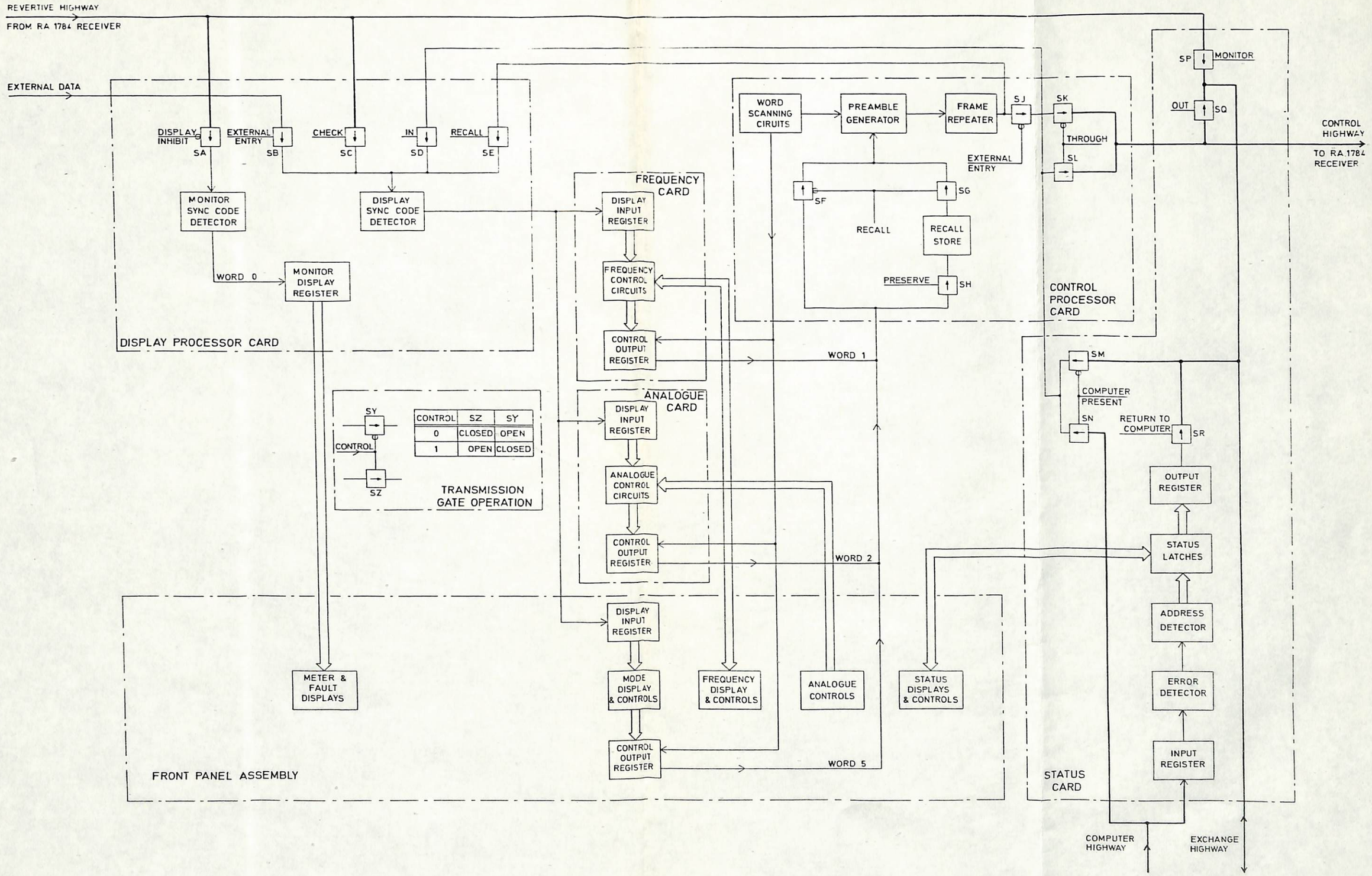
0 USB
1 LSB
2 ISB-U
3 ISB-L

SINGLE FRAME CHECK BITS — WORD 1 BITS 46, 47

0 FRAME COMPARED
1
2 NON FRAME COMPARED

AGC — WORD 5 BITS 37, 38, 39

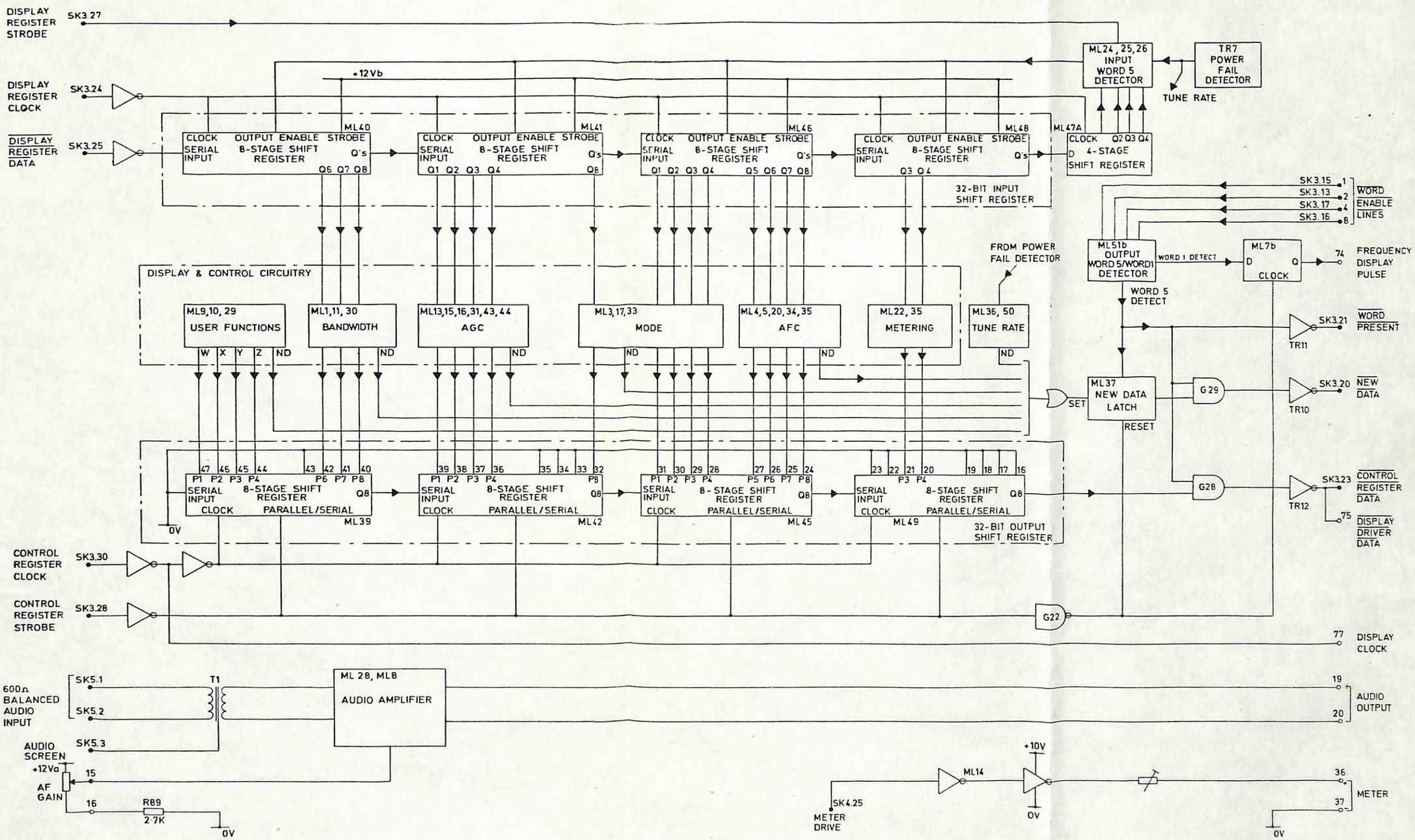
0 MANUAL AND SHORT
1
2 MANUAL AND LONG
3 MANUAL ONLY
4 SHORT
5
6 LONG



RACAL
WOH 7032

Simplified Block Diagram : MA. 1072

Fig. 3.1



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WOH 7032/M

Block Diagram :
Front Panel Board PM 676

Fig. 8.1